JC SYSTEMS

MODELS 488 AND 422

IEEE-488 & RS422/485 DUAL PORT INTERFACES

- IEEE-488 or serial port communications
- Programmed control of two 16-bit bi-directional I/O ports
- Multiple device access from a single computer or instrument controller
- Simplifies system configuration & expansion
- Compatible with all JC Systems Temperature Controllers
- Specially created commands for temperature control applications
- Rack mount for easy installation

SPECIFICATIONS

MODEL 488 GPIB INTERFACE

Modes	Binary Mode, Handler Mode, Controller Mode are available at both ports. For ease of operation, port I/O configuration is automatic: the correct mode is always assumed for the command issued.
Data Transmission	Data is transmitted only after the computer gives the "ready for data" signal. EOI (end of identify), CR (carriage return), and LF (line feed) all end the transmission. EOI is always raised with the last character transmitted. However, these signals are not required by the interface for command termination.
Address	5-bit address switch
Commands	all ASCII characters, 4 mode select commands; 10 binary commands and 6 controller mode commands.
Port Connectors	two 25-pin connectors, Ansley P/N 60925S. Mating connector is Cinch DB-25P or equivalent.
Bus Connector	conforms to IEEE-488 standard.
LED Power-on Indicator	
Package Size (H x W x D)	3.5" x 19" x 8.25" (89 x 482 x 209 mm)
Weight	6 lbs. (2.4 kg)
Power	120 VAC, 50/60 Hz, 20W

MODEL 422 SERIAL INTERFACE

Modes	Binary, Controller and Scaled Modes are available at both ports. To simplify operation, I/O port configuration is automatic: the correct mode is always assumed for the command issued.
Address	01-99, switch selected using two rotary switches.
Commands	All ASCII characters; 13 binary commands, 10 controller commands and 12 scaled mode commands as shown in the command set table.
Port Connectors	Two Ansley P/N 60925S 25-pin connectors. Mating connector (on rear panel) is Cinch DB-25P or equivalent.
Interface Connectors	RS422/485 input and output on the rear panel via 37-pin Cinch DC-37S connectors. Mating connector is Cinch DC-37P or equivalent.
Package Size (H x W x D)	3.5" x 19" x 8.25" (89 x 482 x 209 mm)
Weight	6 lbs. (2.4 kg) excluding optional third port
Power	120 VAC 50/60 Hz, 20W

ORDERING INFORMATION

MODEL 488 DUAL PORT IEEE-488 INTERFACE	C80488A
MODEL 422 DUAL PORT SERIAL INTERFACE	C85422A
Options:	
16 line input isolator accessory	A1160
16 line output isolator accessory	A1164
Port Transition Board	A1606
RS232-C to RS422/485 Level Shifter *(Model 422 only)*	A1740
Third I/O Port (no RT or LCL/RMT commands) *(Model 422 only)*	A1805
4-20/0-16 mA Current Loop *(model 422 only)*	A1034

MODEL 488 INTERFACE PIN-OUTS
(I/O Ports 1 & 2)

Pin #	Binary Mode	Controller Mode	Handler Mode
	I/O Bit	Setpoint/Temp Bit	
1	0	0.1	Falling
14	1	0.2	Edges
2	2	0.4	set SRQ
15	3	0.8	(start test)
3	4	1.0	
16	5	2.0	
4	6	4.0	Auxiliary
17	7	8.0	I/O
5	8	10.0	
18	9	20.0	
6	10(A)	40.0	
19	11(B)	80.0	EOT (strobe)
7	12(C)	100.0	
20	13(D)	200.0	Sort
8	14(E)	400.0	Category
21	15(F)	Negative	
9			
22		Logic Common	
10			
23			
11	*	Controller Nulled	*
24	*	Temp Interrogate	*
12	RMT	RMT	RMT
25	*	Setpoint Valid	*
13	+5V	+5V	+5V

* Not Used

** I/O Port #2 pinout is identical except for pin 11, which has no connection.

MODEL 422 INTERFACE PIN-OUTS
(I/O Ports 1 & 2)

Pin #	Binary Mode	Controller Mode	Scaling Mode
	I/O Bit	Setpoint/Temp Bit	I/O Bit
1	0	0.1	0
14	1	0.2	1
2	2	0.4	2
15	3	0.8	3
3	4	1.0	4
16	5	2.0	5
4	6	4.0	6
17	7	8.0	7
5	8	10.0	8
18	9	20.0	9
6	10(A)	40.0	10(A)
19	11(B)	80.0	11(B)
7	12(C)	100.0	12(C)
20	13(D)	200.0	13(D)
8	14(E)	400.0	14(E)
21	15(F)	Negative	15(F)
9			
22		Logic Common	
10			
23			
11	Print 1 IN*	Controller Nulled*	Print 1 IN*
24	Handshake Output***	Temperature Interrogate	Handshake Output***
12	RMT	RMT	RMT
25	not used	Setpoint Valid	not used
13	+5V	+5V	+5V

* HANDSHAKE INPUT — **RP** will not read data from Port 1 until PRINT 1 input is HIGH or 0.6 sec times out. Handshake is delayed during this time. HOLD remains LOW until read is completed (500 msec minimum).

** I/O Port #2 pinout is identical except for pin 11, which has no connection.

*** HOLD1 and HOLD2 OUTPUT (**RP** Command); DATA VALID1 and DATA VALID 2 (**P** Command). DATA VALID remains LOW while output port is updating after **P** Command (100 msec typical)

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OPERATING INSTRUCTIONS FOR THE MODEL 188A DOUBLE PORT GPIB INTERFACE

1. FEATURES AND CAPABILITIES

JC Systems' Model 188A Interface makes it easy to operate and interrogate all types of digital devices using an IEEE-488 controller.

1.1. AVAILABLE CONFIGURATIONS

The Model 188A is available as a stand-alone unit, or packaged integrally with the Model 270 Single Loop Digital Process Controller in a rack-mount cabinet. Interface input and output isolators and a port transition board are also available as options (see the appendixes).

1.2. COMPATIBILITY

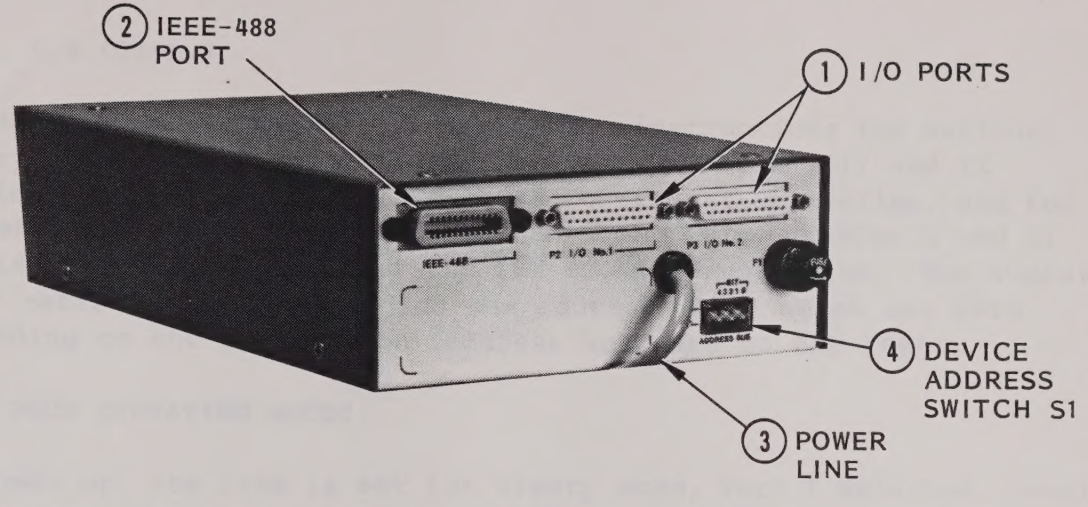
Any GPIB (IEEE-488) controller may be used with the JCS Model 188A. This includes any IBM PC or compatible equipped with the IEEE-488 controller option; Fluke 1720 Instrument Controller, Hewlett Packard HP 85/86 or 9800 series Microcomputers, and the Tektronix 4050 series controllers. Special operating modes and commands are provided to enhance the Model 188A's operation with JC Systems process controllers and setpoint programmers.

1.3. TWO I/O PORTS

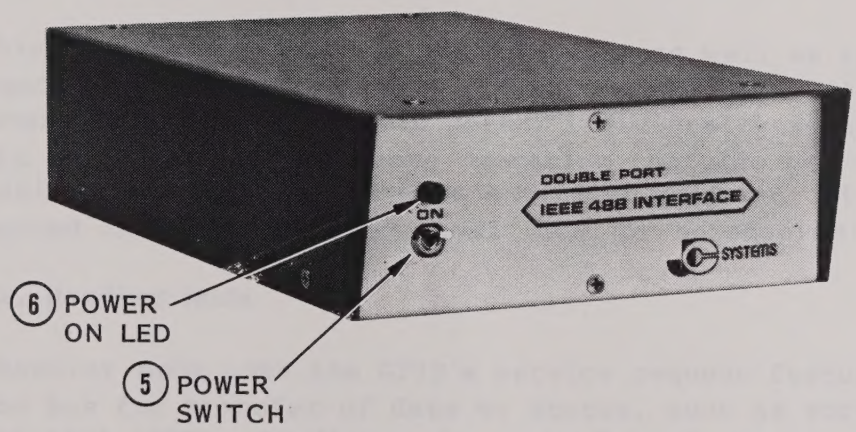
The 188A supports two full 16-bit input/output ports (Figure 1, Item 1) from a single, switch-selectable address location on the IEEE bus. I/O ports output via female connectors P2 and P3 mounted on the rear panel, and mate with standard DB-25 type 25-pin male connectors. The I/O ports support devices whether sending or receiving signals ("talkers" or "listeners" -- see Figure 2). Table I lists interface pinouts for the ports in various modes (described in Para. 1.5). Table II provides the port DC characteristics.

1.4. SOFTWARE CONTROL

General operating commands and a special command set for each operating mode reside in the 188A memory. The commands use standard ASCII characters; data and status responses are presented in either binary coded decimal (BCD) or ASCII form. Status queries, service request (serial poll), and other special commands are included, as shown in Tables III through VII.



A. Rear View.



B. Front View.

Figure 1. Model 188A Double Port GPIB Interface.

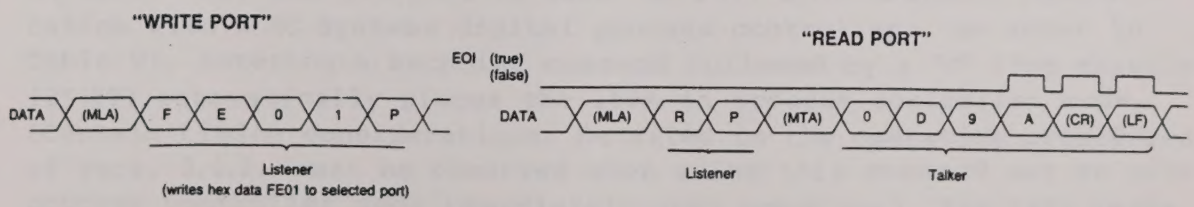
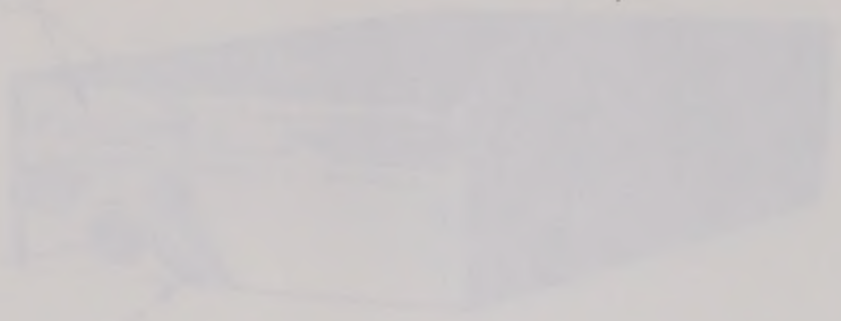


Figure 2. Bus Data Transfer Diagram.



Tables VIII and on show typical software instructions for various binary and temperature controller commands. Tables VIII and IX provide examples for the Fluke 1720A Instrument Controller, and for Hewlett-Packard HP-9825 and HP-85 Microcomputers. Tables X and XI provide similar examples for the IBM PC and compatibles. The numbers "728" refer to the port (7) and bus address (28), which may vary depending on the application (address assigned to the 188A).

1.5. FOUR OPERATING MODES

At power up, the 188A is set for binary mode, Port 1 selected, local operation. The general mode commands (Table III) may be used to select or return to one of the operating modes described below.

1.5.1. Binary (General Purpose) Mode

The binary mode permits bit manipulation, as well as read and write commands to the selected port. In this mode, the 188A provides full I/O control of the two 16-bit ports, individually accessible on a bit-by-bit basis. Local or remote operation can also be software selected using a handshaking line as explained in Para. 1.6. Data are presented as binary coded decimal (BCD) or hexadecimal (hex) characters.

1.5.2. Handler Mode

The handler mode uses the GPIB's service request feature to gain control of the bus for transfer of data or status, such as sort category and end of test (EOT). Handler mode commands and pinout assignments allow closed-loop operation with automatic integrated-circuit handling equipment under computerized control. Commands to enable and disable the serial poll (SRQ) function are included in the software.

1.5.3. Process Controller Mode

In this mode, the I/O port is used for full bidirectional communication with a JC Systems digital process controller. As shown in Table VI, entering a setpoint command followed by a "T" (for example, 125.5T) automatically places the 188A in process controller mode. (Certain timing considerations, detailed in the operating procedures of Para. 2.4.2, must be observed when using this command set to enter process controller mode immediately upon power up.) The 188A reads or writes the setpoint on command, and automatically generates a process temperature interrogation twice a second if one process controller is connected to the 188A, or once a second for each processor if two are connected.

1.5.4. Programmer Monitor Mode

This mode is used to monitor the operation of a JC Systems single setpoint programmer and temperature controller combination. Selecting this mode with a monitor command permits continuous monitoring of the setpoint generated by the programmer and the process temperature (or other variable) read by the controller.

1.6. LOCAL OR REMOTE OPERATION

In addition to the 16 programmable I/O lines, a 17th line, RMT (Pin 12 on both P2 and P3) may be set either HIGH or LOW for local or remote operation. As explained below, a combination of hardware and software switches are used to select the condition of this line.

1.6.1. Default Setting

When shipped, the 188A's are configured for **software** selection of local or remote mode. Local or remote operation is normally used in the process controller mode to select whether the attached controller accepts its setpoint from the 188A (remote operation), or from the controller's own front panel switches (local operation). In the binary or handler mode, the RMT line may be used as a strobe, or for handshaking. In the programmer monitor mode, the RMT line is normally left in the local condition.

1.6.2. Dip Switch Selection

Dip switch S2 on the 188A's printed circuit board assembly can be used to select a hard local/remote switch setting that will not be affected by software commands, or a soft setting that can be modified on command. Dip switches S2-1 and -2 control Port 1; S2-3 and -4 control Port 2. S2-1 and S2-3 are labeled "SFTWR REMOTE"; S2-2 and S2-4 are labeled "REMOTE".

When the hardware switches are positioned so that the 188A accepts software remote commands to both ports, software commands LCL (local) and RMT (remote) will set both ports to the corresponding operational mode.

If one of the ports must operate only in the remote mode, then that port must be set by hardware -- in other words, dip switch S2-2 or -4, as applicable, must be set to the ON position. This will maintain that port in remote mode regardless of the mode selected by the software switch commands LCL or RMT.

Para. 1.6.2. (Cont.)

The settings for dip switch S-2 required to achieved local and remote operating modes are shown below. A "--" under switch setting means that it can be either on or off.

PORT	OPERATING MODE	RMT LINE CONDITION	DIP SWITCH SETTING S2-1	S2-2	S2-3	S2-4
1	Hardware Remote[1]	Low	--	ON	--	--
1	Hardware Local[1]	High	OFF	OFF	--	--
1	Software Select Local or Remote [2]	Low	ON	OFF	--	--
2	Hardware Remote[1]	Low	--	--	--	ON
2	Hardware Local[1]	High	--	--	OFF	OFF
2	Software Select Local or Remote [2]	Low	--	--	ON	OFF

[1]Operator **cannot** use software to change setting.
[2]Operator **can** use software to change setting.

2. OPERATING PROCEDURE

2.1. INSTALLATION

The 188A may be rack mounted (3-1/2 in. vertical space required) or bench mounted. In the latter case, be sure that rubber feet are installed to prevent bench surface damage.

The 188A is also available as an integral rack-mount unit combined with the Model 270 Single Loop Setpoint Controller.

2.2. SETUP FOR OPERATION

1. If necessary, set local/remote hardware dip switch (S2) to desired configuration (see Table X and Para. 1.5.1). This requires removing the cover to gain access to the 188A PCB.
2. Connect IEEE-488 system controller to P1 (Item 2) on the 188A.
3. Connect devices to I/O ports 1 and 2 (P2 and P3, Item 1).
4. Plug in power line (Figure 1, Item 3).

Para. 2.4 (Cont.)

If either of these conditions is not met, you will read garbage in response to your "RT" (read temperature) command. Note that these requirements apply only immediately after power-up. Once the process controller mode has been selected and the 188A has had enough time to access the current process variable from the digital controller, the 188A will automatically access the process variable twice a second when one controller is connected, or once a second for each controller when two are connected. This updated information is thereafter available for immediate transmission to the system controller upon receipt of an RT command.

2.5. HANDLER MODE

Referring to Table I, note that bits 0 thru 3 may be used to generate a service request (SRQ). In normal handler operation, only one line would be software-selected by the user as an input, typically for the START TEST command. However, the other three bits may be programmed by the user to generate a serial request for other purposes -- for example, when the handler chamber exceeds limits. Bits are edge-sensitive; an SRQ is generated by a high-to-low transition on any of the bit 0 thru 3 lines of the HANDLER port.

2.6 PROGRAMMING

The user must develop suitable programs that cause the system controller to generate the correct 188A command sets for functions desired. The examples given in Tables VIII and on are provided to assist users in developing their programs.

TABLE I. PINOUTS FOR I/O PORTS.

PIN #	BINARY MODE FUNCTION	PROCESS CONTROLLER/ PROGRAMMER MONITOR FUNCTION	HANDLER MODE FUNCTION
1	I/O Bit 0	Setpoint/Temp .1 Bit	Falling edges set SRQ (Start Test or other function)
14	1	.2	
2	2	.4	
15	3	.8	
3	4	1	
16	5	2	
4	6	4	Auxiliary I/O
17	7	8	
5	8	10	
18	9	20	
6	10(A)	40	
19	11(B)	80	/Sort Category Strobe (5ms low-going pulse)
7	12(C)	100	Sort Category (Negative logic) (IEEE Output to handler)
20	13(D)	200	
8	14(E)	400	
21	15(F)	Negative	
9			
10			
22	Logic common	Logic common	Logic common
23			
11	PRINT 1 IN*	/Controller Nulled**	***
24	HANDSHAKE OUTPUT#	/Temperature Interrogate	***
12	/RMT	/RMT	/RMT
25	***	Setpoint Valid	***
13	+5V	+5V	+5V

See next page for footnotes (*, **, ***, #)

FOOTNOTES TO TABLE I

* HANDSHAKE INPUT -- "RP" will not read data from Port 1 until PRINT 1 input is high or 0.6 sec. times out, whichever occurs first. GPIB handshake is delayed during this time. /HOLD remains low until read is completed (500 µsec minimum).

** I/O Port #2 pinout is identical except for Pin 11, which has no connection.

*** Not used.

\# /HOLD 1 or /HOLD2 OUTPUT (for "RP" command)
DATA VALID 1 or DATA VALID 2 OUTPUT (for "P" command)
DATA VALID remains low while output port is updating after a "P" command (100 µsec typical)

TABLE II. I/O PORT DC CHARACTERISTICS (8243 DEVICE TYPE).

SYMBOL	PARAMETER	MIN.	MAX.	UNITS	TEST CONDITIONS
V_{IL}	Input Low Voltage	-0.5	0.8	V	I_{IL} = -400 µA
V_{IH}	Input High Voltage	2.0	5.5	V	
V_{OL}	Output Low Voltage		0.45	V	I_{OL} = 5mA
V_{OH}	Output High Voltage	2.4		V	I_{OH} = -240 µA

TABLE III. GENERAL COMMAND SET

COMMAND	FUNCTION
IO1	Select port 1.
IO2	Select port 2.
H	Place selected port into HANDLER mode.
xxxxT	Place selected port into PROCESS CONTROLLER mode.
M	Place selected port into PROGRAMMER MONITOR mode.
RP or xxxxP	Place selected port into BINARY mode.

TABLE IV. BINARY MODE COMMAND SET

COMMAND	FUNCTION
Sx	Set bit x of selected port, where x is a hex character 0-F, representing bit 0-15, respectively.
Rx	Reset bit x of selected port, represented as above.
xxxxP	Write xxxx to selected port (and latch), where xxxx represents a one- to four-digit hex or BCD number. If fewer than four digits, leading zeros will be assumed.
RP	Read the selected port as a string of four hex or BCD digits, representing the status of 16 bits.
LCL	Open the RMT lines (whose HARD REMOTE switches are turned off), and latch. (May be used for handshaking.)
RMT	Ground the RMT lines (whose SOFTWARE REMOTE switches are turned on), and latch. (May be used for handshaking.)

TABLE V. HANDLER MODE COMMAND SET

COMMAND	FUNCTION
Hx	Write the 1's complement of the hexadecimal number represented by **x** to bits 12-15 of the selected port, latch, and then pull bit 11 to ground for 5 msec. **x** is a hex character 0-F. (Bits 12-15 typically connect to the handler's sort category input, and bit 11 to the EOT input.)
RQD	Disable SRQ. (The 188A powers up with SRQ disabled.
RQN	Enable SRQ. Any low levels present on bits 0 thru 3 of the handler port(s) while SRQ is disabled will generate a service request when SRQ is reenabled. Subsequent SRQ's will be generated by falling edges on the same bits.
ST?	Read the 8 bit serial poll register as a single ASCII character code, and clear the register. A NUL character (binary 0) indicates no activity on bits 0-3 of the handler port(s) since last read. (Falling edges on input bits 0-3 of the handler port(s) set corresponding bits, as well as bit 6, in the serial poll register.) SRQ is asserted anytime register bit 6 is set and SRQ is enabled. The above data can be read and cleared with a normal serial poll sequence just as with "ST?". If both ports are in HANDLER mode, bits 0-3 of port 1 are ANDed with the corresponding bits of port 2.
N	Clear the serial poll register and pull bit 11 of the selected port to ground for 5msec.
Sx	Set bit **x** of selected port, where **x** is a hex character 4-A representing bit 4-10, respectively.
Rx	Reset bit **x** of selected port, represented as above.
LCL	Operates as described in BINARY mode.
RMT	Operates as described in BINARY mode.

TABLE VI. PROCESS CONTROLLER MODE COMMAND SET

COMMAND	FUNCTION
K	Kill (turn off) controller connected to selected port and set REMOTE mode.
xxx.xT	Write setpoint xxx.x to selected port, where xxx.x is a signed one- to four-digit number with or without decimal point. If fewer than four digits, leading zeros are assumed. If the sign is omitted, + is assumed. Execution of this command also sets REMOTE mode.
RS	If the 188A is in REMOTE mode, read the previously written setpoint from the selected port in the format ±xxx.x, where ± is the sign and xxx.x is a four digit number resolved to a tenth of a unit. (Leading zeros are returned if necessary.) If the 188A is in LOCAL mode, the setpoint cannot be read and "----" is returned.
RT	Read the process variable (temperature) from the controller connected to the selected port in the format S±xxx.x, where ±xxx.x is as described above and S is a status character. If the status character is an "F", the controller communication has failed (due to open probe, disconnected ribbon cable, or hardware failure). If it is an "L", the setpoint is outside the controller's limit or the controller has been "killed". If "N", the controller is not nulled (Port 1 only); otherwise, (sp) is returned.
LCL	Places into LOCAL mode the ports whose hard REMOTE switches are off . The corresponding controllers will then take their setpoints from their front panel thumbwheel switches.
RMT	Places into REMOTE mode the ports whose hard REMOTE switches or whose SOFTWARE REMOTE switches are on. The corresponding controllers will then take their setpoints from their 188A ports. This command does not automatically place the unit in Process Controller Mode.

TABLE VII. PROGRAMMER MONITOR MODE COMMAND SET

COMMAND	FUNCTION
RS	Read the setpoint currently issued from the programmer connected to the selected port. The format is as described under PROCESS CONTROLLER mode. In this case, the setpoint may be read in either LOCAL or REMOTE mode.
RT	Read the last process variable interrogated by the programmer connected to the selected port. The format is as described under PROCESS CONTROLLER mode. In this case, an additional cause of the "F" status character is "programmer not running (executing stored program)". The process variable may be read in either LOCAL or REMOTE mode.

TABLE VIII. TYPICAL SOFTWARE COMMANDS FOR BINARY MODE OPERATION.

FLUKE 1720A	HP9825	HP 85	FUNCTION
PRINT @28, "IO2"	wrt 728, "IO2"	OUTPUT 728; "IO2"	Sets IO2. All subsequent operations occur at Port 2.
PRINT @28, "S0"	wrt 728, "S0"	OUTPUT 728; "S0"	Sets (raises to +5V) line 0 of selected I/O port.
PRINT @28, "RA"	wrt 728, "RA"	OUTPUT 728; "RA"	Reset (drop to OV) line 10 of selected I/O port. A is the hexadecimal number for 10.
PRINT @28, USING "#,###",A$;"P"	fmt 4c, "P" wrt 728,A$	OUTPUT 728; A$&"P"	Write string variable A$ (4 hex characters maximum) to previously selected port.
PRINT @28, "439EP"	wrt 728, "439EP"	OUTPUT 728;"439EP"	Write 439E to previously selected port.
PRINT @28, "RP" INPUT @28, A$	wrt 728, "RP" dim A$ (4) red 728, A$	OUTPUT 728; "RP" ENTER 728; A$	Read four digit hex data from previously selected port into A$.
PRINT @28, "RP" INPUT @28, A$ A=VAL (A$)	wrt 728, "RP" fmt f4 red 728, A	OUTPUT 728; "RP" ENTER 728; A$ A=VAL (A$)	Read four-digit decimal data from previously selected port into A.

TABLE IX. TYPICAL SOFTWARE COMMANDS FOR PROCESS (TEMPERATURE) CONTROLLER MODE

FLUKE 1720A	HP9825	HP 85	FUNCTION
PRINT @28, "-11.1T"	wrt 728, "-11.1T"	OUTPUT 728; "-11.1T"	Write setpoint of -11.1 to selected I/O port.
PRINT @28, "1T"	wrt 728, "1T"	OUTPUT 728;"1T"	Write 1° to controller setpoint.
PRINT @28, "001.0T"	wrt 728, "001.0T"	OUTPUT 728; "001.0T"	Write 1° to controller setpoint.
PRINT @28, "+319.7T"	wrt 728, "+319.7T"	OUTPUT 728; "+319.7T"	Write 319.7° to contoller setpoint.
S$=NUM$(S)+ "T" PRINT @28, S$	fmt f6.1, "T" wrt 728, "S"	S$=VAL$(S) OUTPUT 728; S$[1,6]&"T"	Write content of variable S to controller setpoint. (S is a fixed point decimal quantity.)
PRINT @28, "RS" INPUT @28, S$	dim S$ (6) wrt 728, "RS" red 728, S$	OUTPUT 728; "RS" ENTER 728; S$	Read previously written controller setpoint from selected port and store six-character ASCII string in variable S$. (First character is sign. 5th character is decimal point.)
PRINT @28, "RS" INPUT @28, S$ S=VAL (S$)	wrt 728, "RS" fmt f6.1 red 728, S	OUTPUT 728; "RS" ENTER 728; S$ S=VAL (S$)	Same as above, except setpoint is stored as a fixed decimal quantity in variable S.
PRINT @28, "RT" INPUT @28, T$	dim T$ (7) wrt 728, "RT" red 728, T$	OUTPUT 728; "RT" ENTER 728; T$	Read controller temperature and status from selected port and store seven-character ASCII string in variable T$. (First character is status, 2nd is sign, 6th is decimal point.)
PRINT @28, "RT" INPUT @28, T$ T=VAL (RIGHT (T$,6)) T$=LEFT (T$,1)	dim T$ (1) wrt 728, "RT" fmt c, f6.1 red 728, T$, T	OUTPUT 728; "RT" ENTER 728; T$ T=VAL (T$[2,7]) T$=T$[1,1]	Same as above, except status character is stored in string variable T$ and temperature is stored as a fixed point decimal quantity in variable T.

APPENDIX A. MODEL A1160 INTERFACE INPUT ISOLATOR

The A1160 Input Isolator printed circuit board performs two functions: 1) provides photocoupling for the 16 input lines of the 188A Dual Port Interface and 2) corrects for differences of potential between the 188A and external devices.

A ribbon cable connects the A1160 Input Isolator and the 188A Interface. The cable runs from J1, a 26-pin RC header on the isolator board, to P2 (I/O 1) or P3 (I/O 2), DB-25 type male connectors on the 188A.

An 18-pin terminal strip provides for hookup of external inputs. Pins 1 through 16 are used for the 16 input lines. The external ground and source voltage necessary for the input drivers connect at Pins 17 and 18.

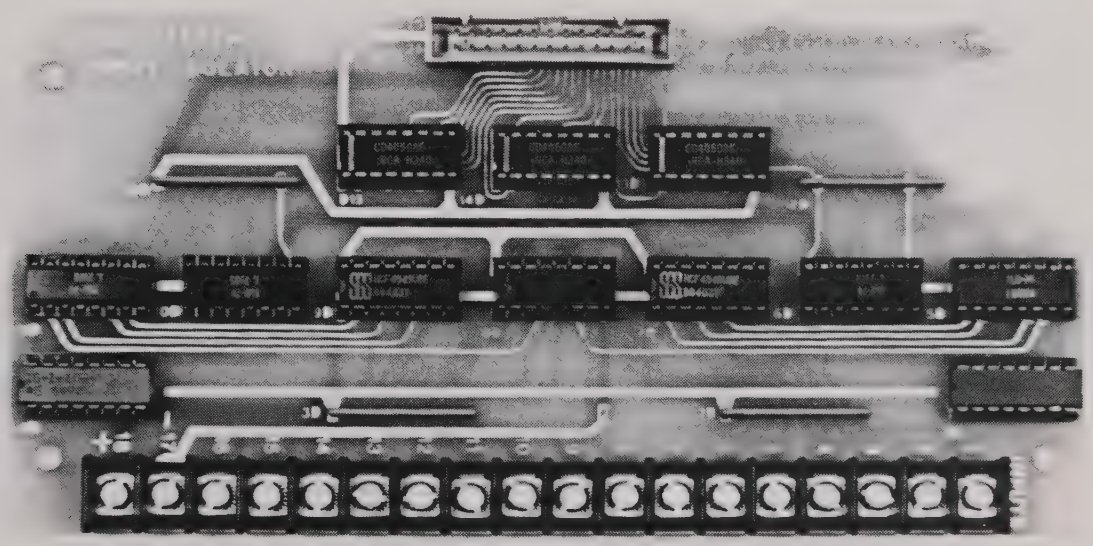


Figure A-1. Model A1160 Input Isolator Printed Circuit Board.

APPENDIX B. MODEL A1164 INTERFACE OUTPUT ISOLATOR

The A1164 Output Isolator printed circuit board provides photocoupling for the 16 output lines of the 188A Dual Port Interface. The board is also used to correct for differences in potential between the 188A and external devices.

A ribbon cable connects the A1160 Input Isolator and the 188A Interface. The cable runs from J1, a 26-pin RC header on the isolator board, to P2 (I/O 1) or P3 (I/O 2), DB-25 type male connectors on the 188A.

An 18-pin terminal strip provides for hookup of external outputs. Pins 1 through 16 are used for the 16 output lines. The external ground and source voltage necessary for the output drivers connect at Pins 17 and 18.

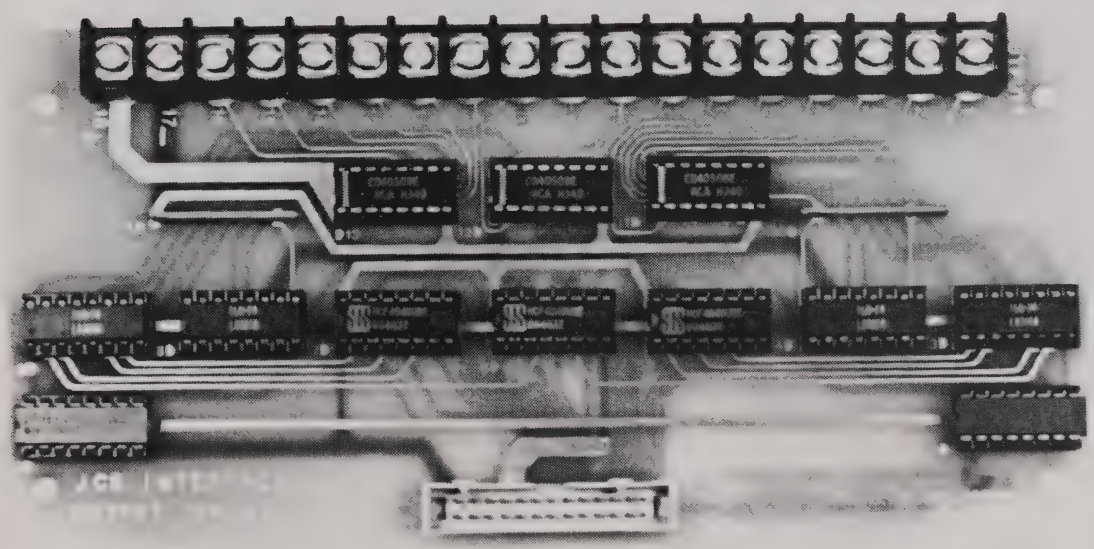


Figure B-1. Model A1164 Output Isolator Printed Circuit Board.

APPENDIX C. MODEL A1604 PORT TRANSITION BOARD

Input or output devices such as photocoupled solid-state relays may be conveniently connected to the 188A Interface using the A1604 Port Transition Board.

A ribbon cable connects the 188A Interface and the A1604 Port Transition. The cable runs from J1, a 26-pin RC header on the transition board, to P2 (I/O 1) or P3 (I/O 2), DB-25 type male connectors on the 188A.

A terminal strip provides for hookup to external connections from the 188A Interface port outputs. Pins are available for the 16 I/O lines, as well as ground and 5-volt source voltage.

Figure C-1. Model A1604 Port Transition Board.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD
	B	REDRAWN IN INC.; 3M CONN. WAS ANSLEY	12-20-84	

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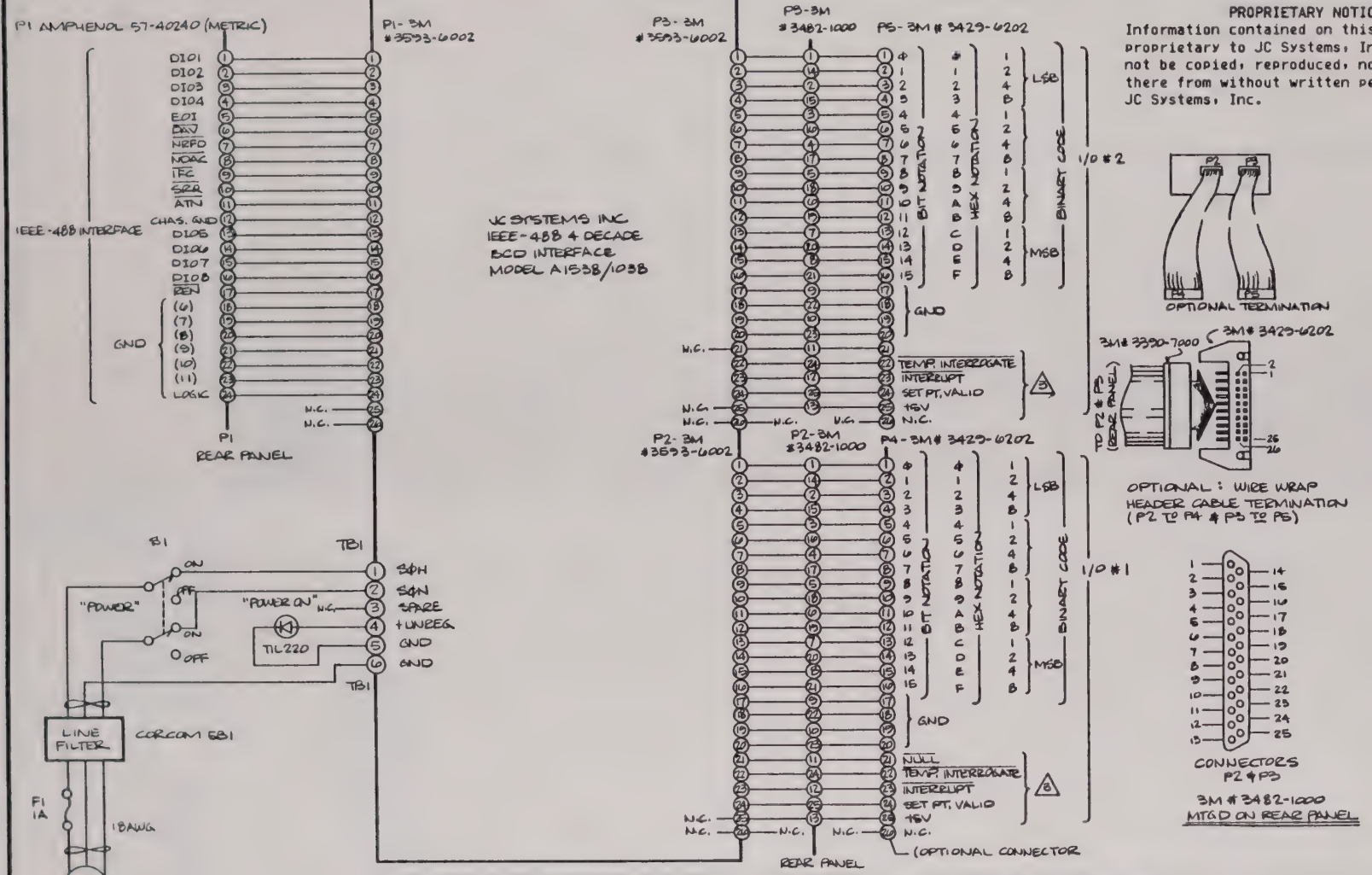


⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

⚠ USED FOR TEMPERATURE CONTROLLER INTERFACE CONNECTIONS ONLY.

NOTES: UNLESS OTHERWISE SPECIFIED

DASH	QTY	NEXT ASSY	USED ON
APPLICATION			

SERIAL NO.	DATE EFF	DWG REV
EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0°30'

HOLE TOLERANCES

.013 THRU .133 +.006 -.001	.261 THRU .500 +.006 -.001
.136 THRU .250 +.008 -.001	.515 THRU .750 +.008 -.001

MATERIAL ⚠1

FINISH ⚠2

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC
DRAFTED	" 20 DEC 1984
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

JC SYSTEMS, INC.

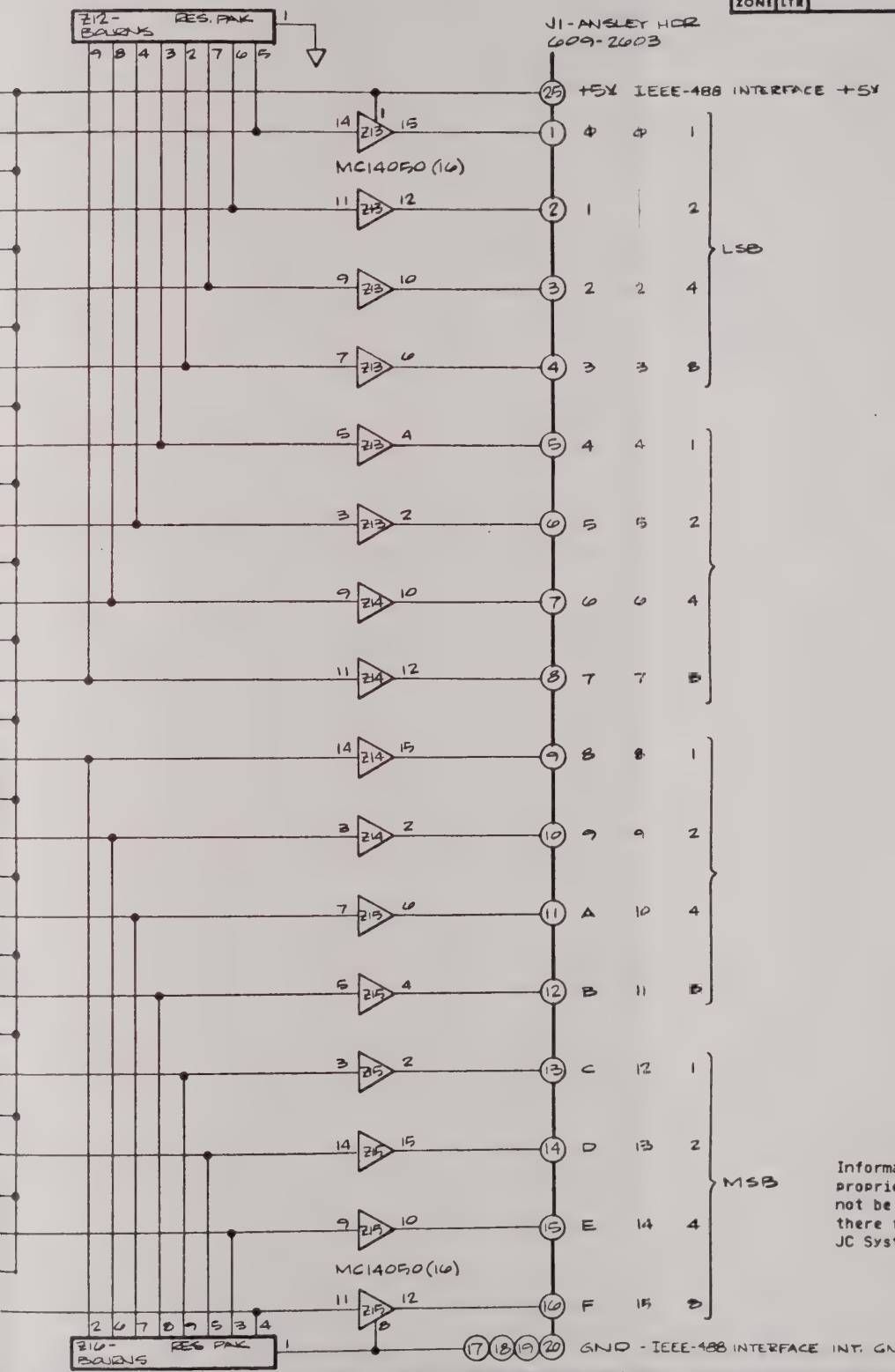
TITLE: WIRING DIAGRAM — IEEE-488 INTERFACE UNIT MODEL

SIZE	CODE IDENT	
C		1044 B

SCALE N.A.

SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPD

PROPRIETARY NOTICE

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DASH	QTY	NEXT ASSY	USED ON
	1	A1160	

APPLICATION

SERIAL NO.	DATE EFF	DWG REV
1 & ON	9-1-80	NC

EFFECTIVITY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03, .XXX ± .010
ANGLES: 0° 30'
HOLE TOLERANCES

MATERIAL

FINISH

ENGINEERING ACTIVITY

DESIGN	K SYSTEMS INC.
DRAFTED	" 01 SEPT 1980
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

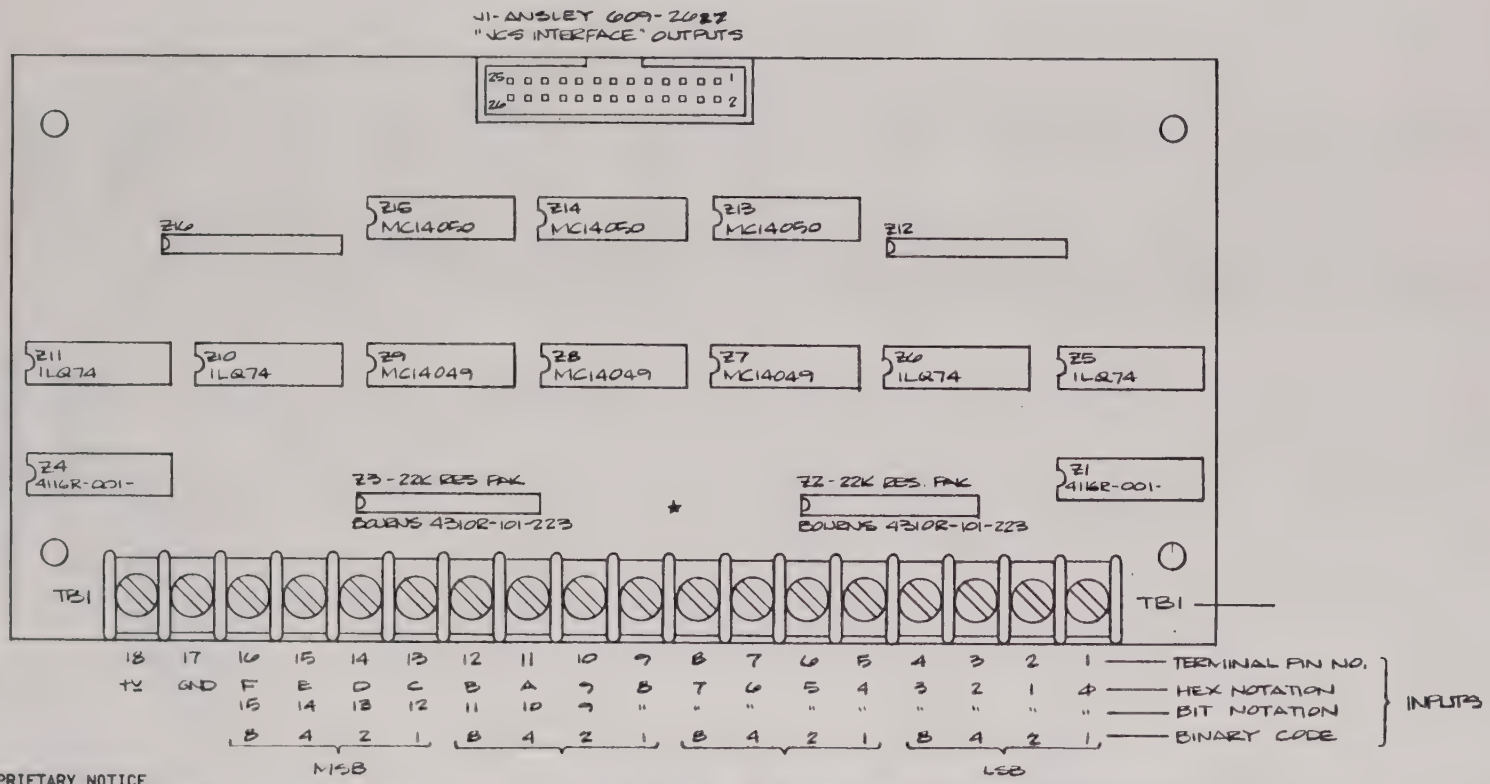
JC ENTERPRISES

TITLE: PRINTED CIRCUIT BD 501-16 LINE INPUT ISOLATOR MODEL A1160

SIZE	CODE IDENT	
D		1159

SCALE N.A. SHEET ___ OF ___

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD



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⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

DASH	QTY	NEXT ASSY	USED ON
	1	END ITEM	

APPLICATION

SERIAL NO.	DATE EFF	DWG REV
1 & UP	5-1-80	M/C

EFFECTIVITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0°30'

HOLE TOLERANCES

.010 THRU .138	+.004 -.001	.221 THRU .500	+.004 -.001
.236 THRU .500	+.006 -.001	.501 THRU .750	+.006 -.001

MATERIAL ⚠1
FINISH ⚠1

DO NOT SCALE DWG

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC.
DRAFTED	" 01 SEPT 1980
CHECKED	
APPROV	
RELEASE	

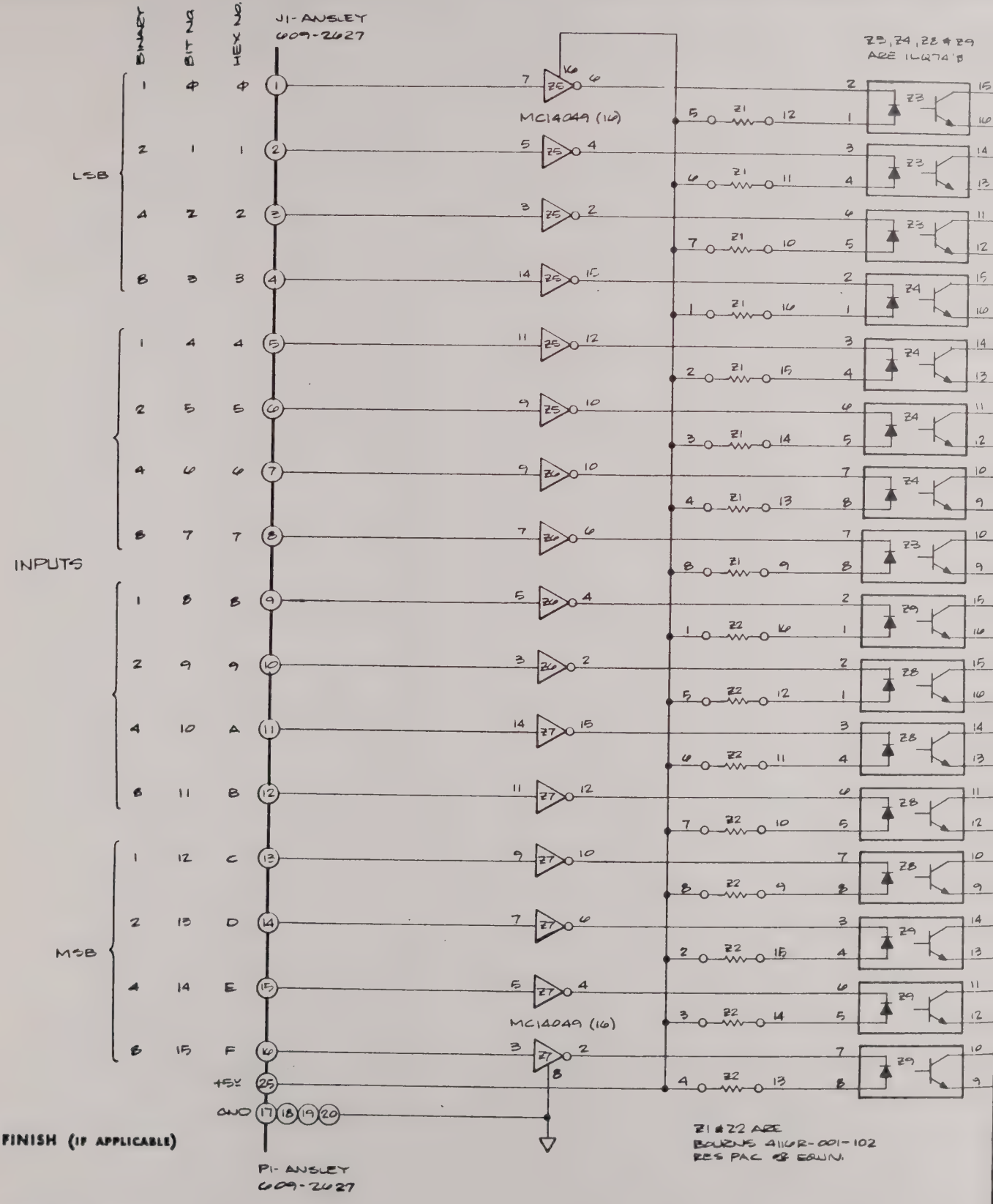
ENTERPRISES
SAN DIEGO, CALIFORNIA

TITLE: PRINTED CIRCUIT BD ASSY
10 LINE INPUT ISOLATOR
MODEL A1160

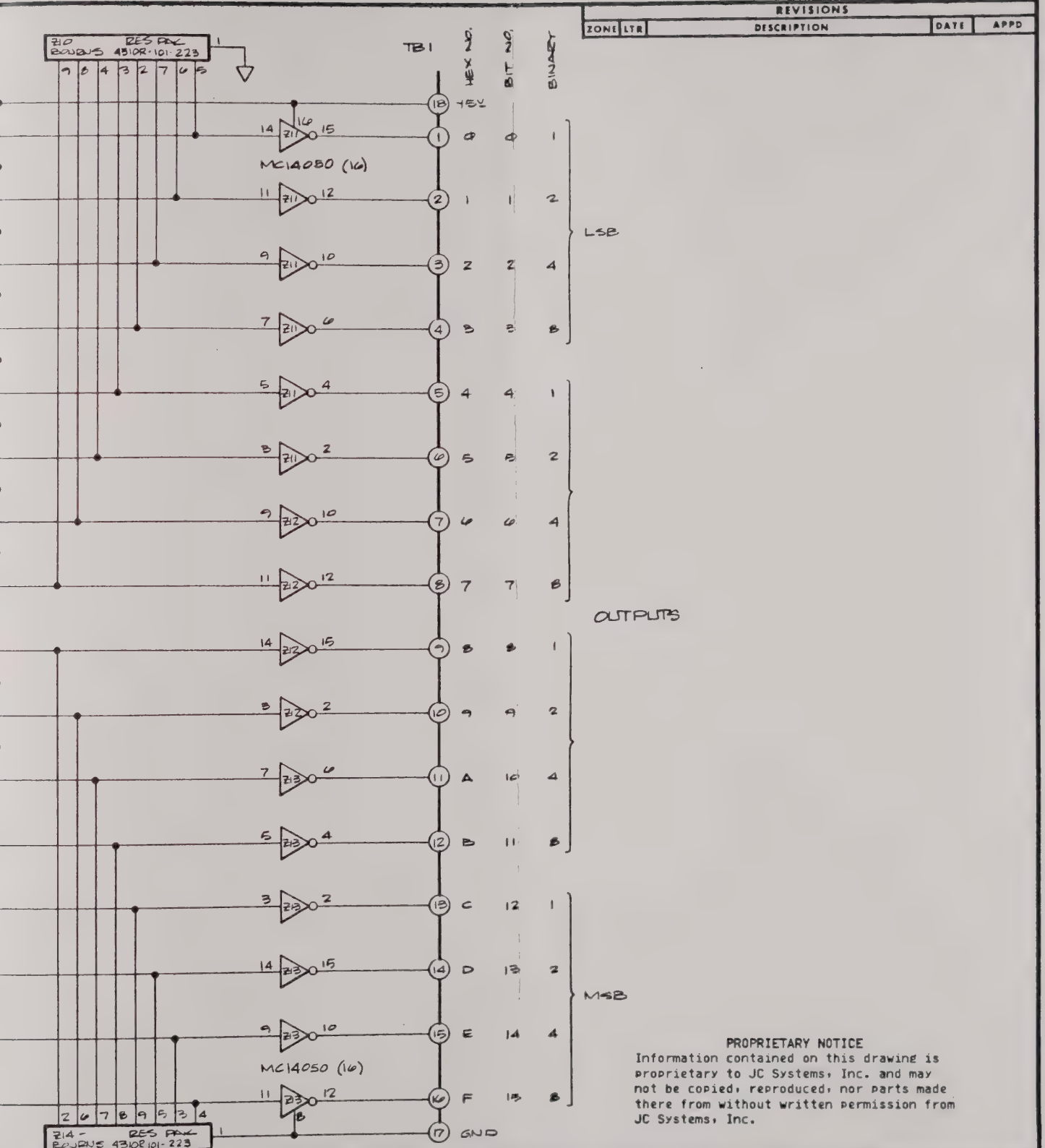
SIZE	CODE IDENT	
C		1160

SCALE 2:1

SHEET 1 OF 1



NOTES: UNLESS OTHERWISE SPECIFIED



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD

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DASH	QTY	NEXT ASSY	USED ON
	1	A1164	
APPLICATION			

SERIAL NO.	DATE EFF	DWG REV
1 & UP	9/80	N/C
EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ± .03 .XXX ± .010 ANGLES 0°30'

HOLE TOLERANCES

MATERIAL

FINISH

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC.
DRAFTED	" 08 SEPT 1980
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

JC ENTERPRISES

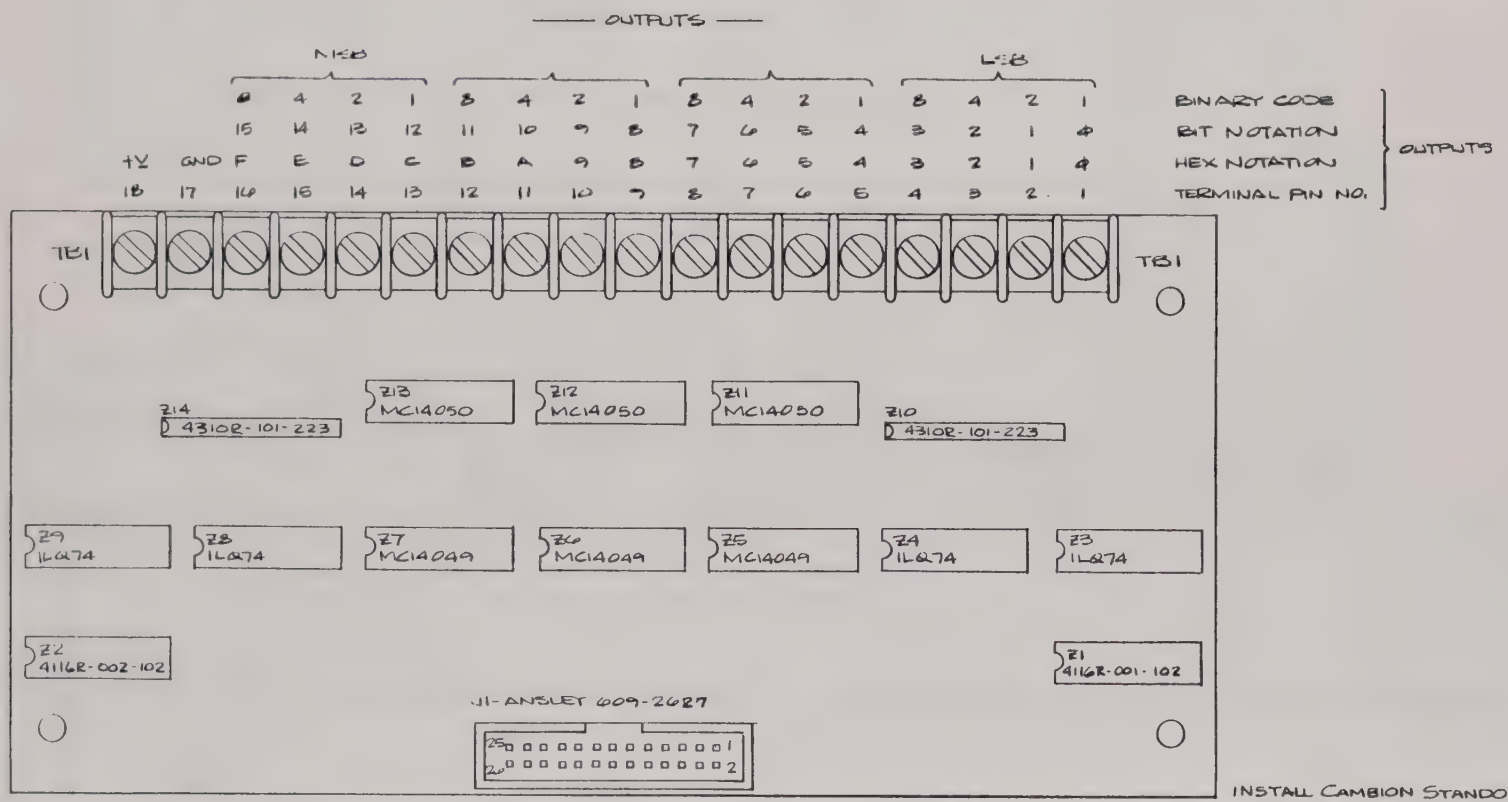
TITLE: PRINTED CIRCUIT BD SCH - 16 LINE OUTPUT ISOLATOR MODEL A1164

SIZE	CODE IDENT	
D		1163

SCALE N.A.

SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD



INSTALL CAMBION STANDOFFS (4 ea)
350-7409-11-19-00

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DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV
	1	U.D ITEM		1 AN	9-6-,	N/C
APPLICATION				EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ± .03 .XXX ± .010
ANGLES 0°30'
HOLE TOLERANCES

MATERIAL ⚠1
FINISH ⚠2

ENGINEERING ACTIVITY		
DESIGN	JC SYSTEMS INC.	
DRAFTED	" 05 SEPT 1980	
CHECKED		
APPROV		
RELEASE		
DO NOT SCALE DWG		

ENTERPRISES

TITLE: PRINTED CIRCUIT BD ASSY - 16 LINE OUTPUT ISOLATOR MODEL A1104

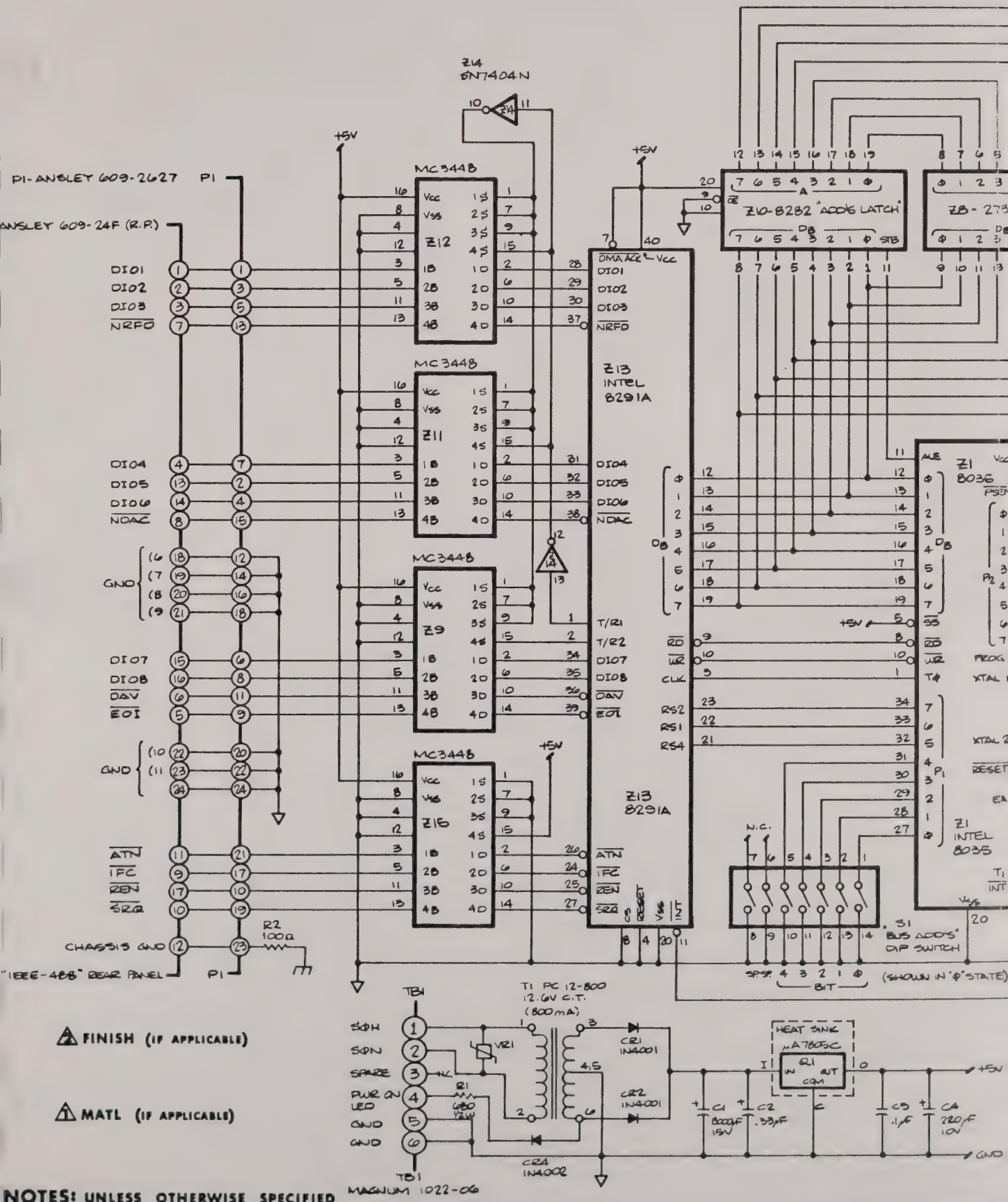
SIZE	CODE IDENT	
C		1104

SCALE 2:1 SHEET 1 OF 1

⚠1 FINISH (IF APPLICABLE)

⚠2 MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED



⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS
ZONE LTR DESCRIPTION DATE APPD
Z4-4310R-101-223
22K RES SIP
Z3-4310R-101-223
22K RES SIP
Z7-4310R-101-223
22K RES SIP
Z5-4310R-101-223
22K RES SIP
Z2 INTEL 8243 "I/O#2"
Z6 INTEL 8243 "I/O#1"
+5V
2732A ("F")
2716
74LS74 (Z14)
Q2-VN10KM
Q3-VN10KM
Q4 VN10KM
XTAL 1 GE42 3.579545 MHz
C5 20pF
C6 20pF
C7 1.0µF
R4 22K
R3 22K
R5 22K
S2-1
P3- ANSLEY 609-2627
SET POINT I/O #2 TEMP
.1
.2
.4
.8
1
2
4
8
10
20
40
80
100
200
400
NEG
GND
TEMP INTERROGATE
REMOTE
SETPOINT VALID
(+5V)
P3
P2- ANSLEY 609-2627
SET POINT I/O #1 TEMP
NULL
P2
S2-1 THRU 4 SHOWN IN "1" OR FALSE STATE
3 on 1 off
2 & 4 from O UP
1 & 3 from O DOWN
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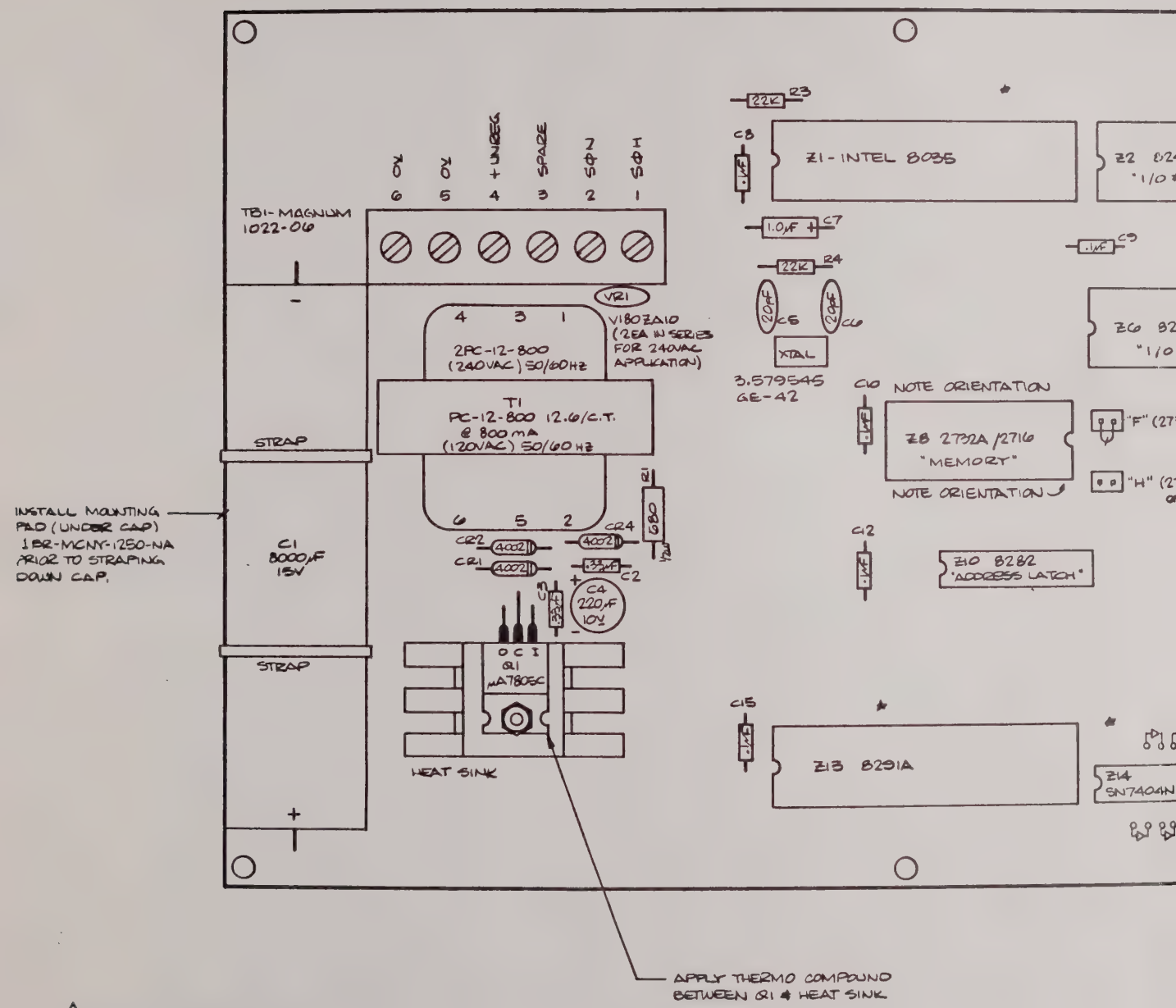
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ± .03 .XXX ± .010
ANGLES 0°30'
HOLE TOLERANCES
ENGINEERING ACTIVITY
DESIGN JC SYSTEMS INC
DRAFTED 19 JAN 1983
CHECKED
APPROV
RELEASE
DO NOT SCALE DWG
JC SYSTEMS, INC.
TITLE: PRINTED CIRCUIT BD SCH - IEEE-488 4 DECADE BCD INTERFACE MODEL A1538/1038
SIZE D
CODE IDENT
1537/1037
B
SCALE N.A.
SHEET 1 OF 1
DASH QTY NEXT ASSY USED ON SERIAL NO. DATE EFF DWG REV
APPLICATION EFFECTIVITY
MATERIAL
FINISH



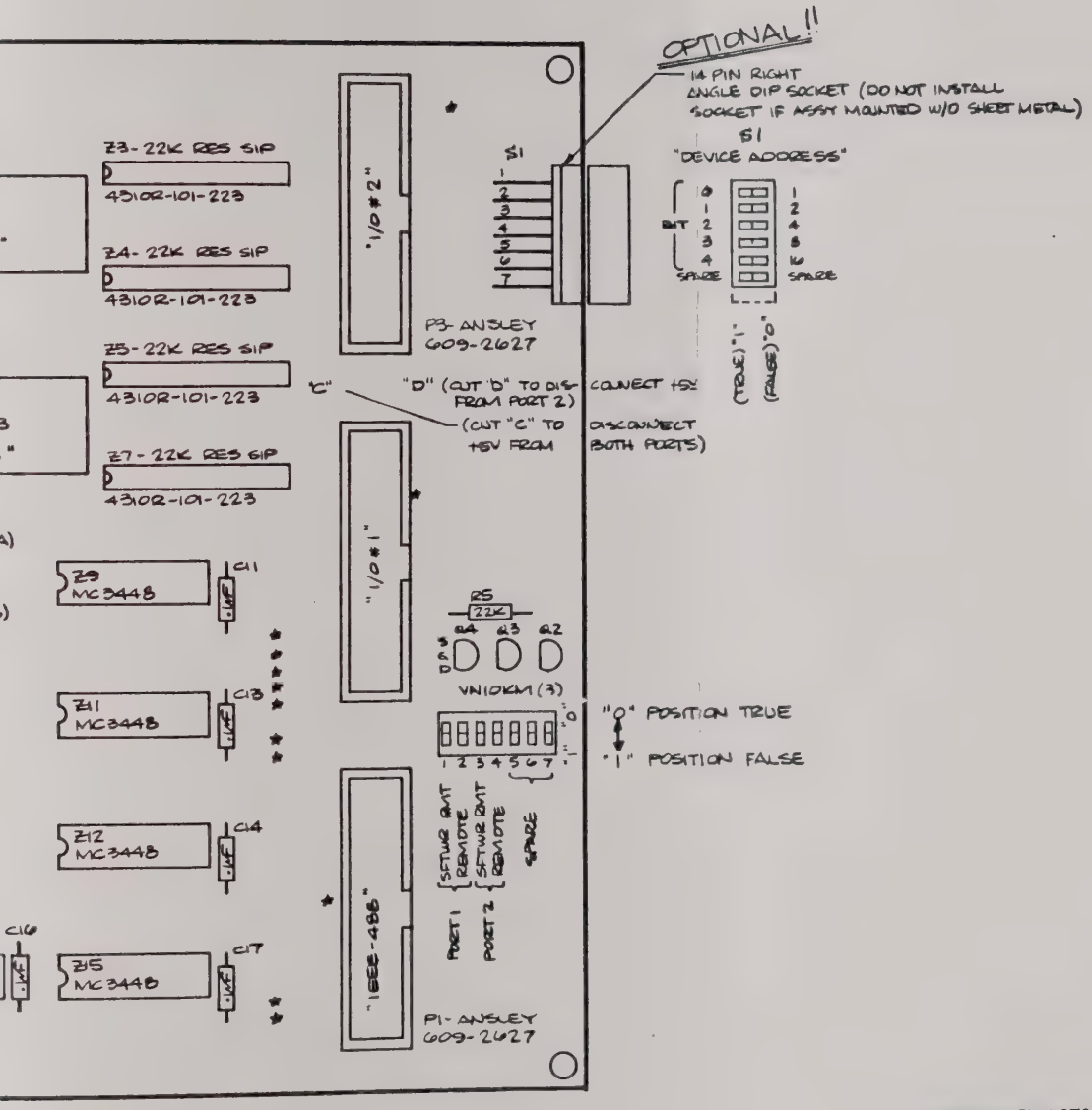
3 INSTALL JUMPER 'E' FOR 8748 AND OMIT 8282 (Z10) & 2716/2732A (Z8).

4 FINISH (IF APPLICABLE)

1 MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPD
	A	MOVED R1 (1/4") TOWARD BD EDGE. ADDED R2, R3, R4 & R5 & PROTO CORRECTIONS	1-21-83	
	B	INSTALL JUMPER "F" FOR 2732A PART NO.	1-21-83	



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DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV
APPLICATION				EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ± .03 .XXX ± .010
ANGLES 0° 30'
MOVE TOLERANCES
MATERIAL
FINISH

ENGINEERING ACTIVITY

DESIGN	JC SYSTEMS INC
DRAFTED	26 JAN 1983
CHECKED	
APPROV	
RELEASE	

DO NOT SCALE DWG

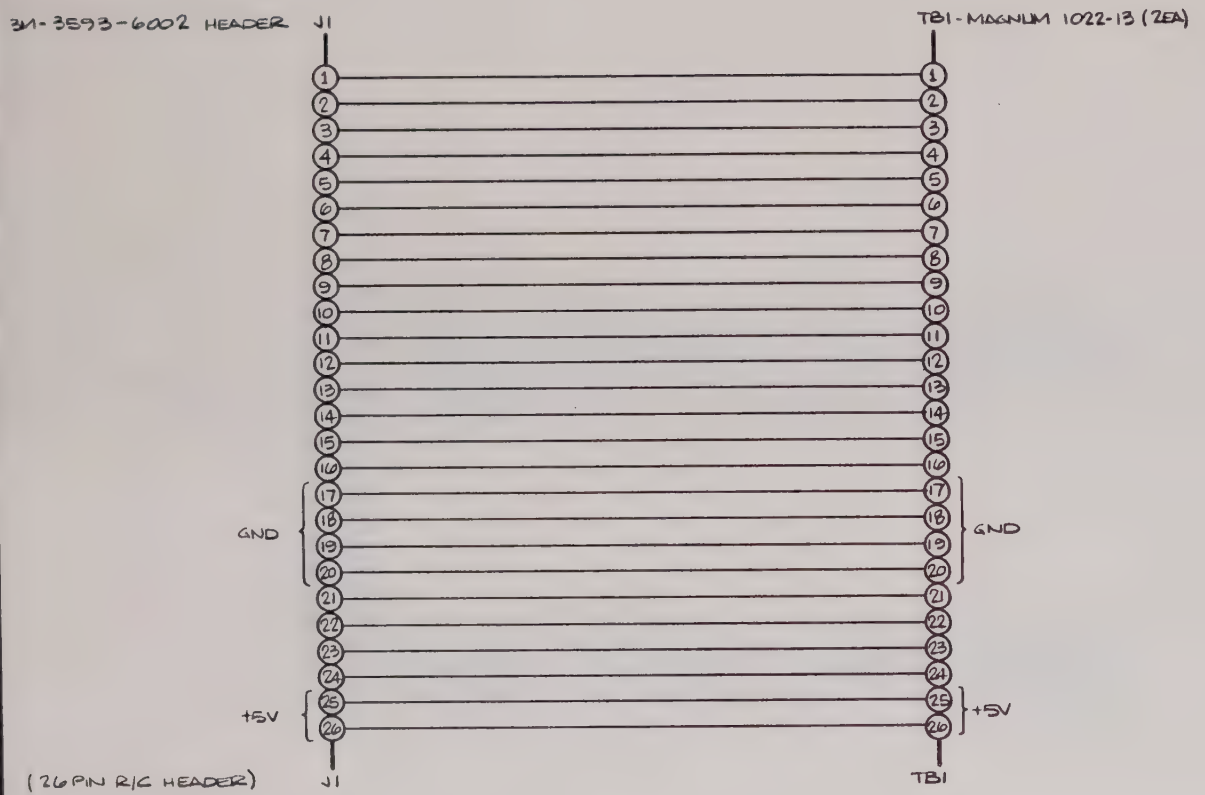
JC SYSTEMS, INC.

TITLE: PRINTED CIRCUIT BD ASSY- IEEE-488 4 DECADE BCD INTERFACE MODEL A1538/1038

SIZE	CODE IDENT		
D		1538/1038	B

SCALE 2:1 SHEET 1 OF 1

REVISIONS			
ZONE	LTR	DESCRIPTION	APPD



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DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV
APPLICATION				EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0°30'

HOLE TOLERANCES

.013 THRU .128	+.004 −.001	.251 THRU .500	+.006 −.001
.130 THRU .250	+.005 −.001	.501 THRU .750	+.008 −.001

MATERIAL ⚠1
FINISH ⚠2

ENGINEERING ACTIVITY	
DESIGN	JC SYSTEMS INC
DRAFTED	" 15NOV 1983
CHECKED	
APPROV	
RELEASE	
DO NOT SCALE DWG	

JC SYSTEMS, INC.
SAN DIEGO CALIFORNIA

TITLE: PRINTED CIRCUIT BD SCH — PORT TRANSITION MODEL A1604

SIZE	CODE IDENT	
C		1603

SCALE N.A. SHEET 1 OF 1

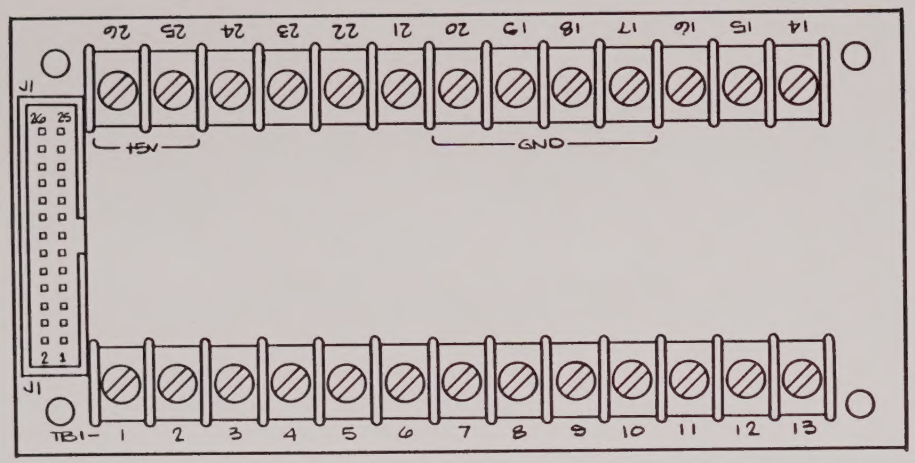
⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
ZONE	LTR	DESCRIPTION	APPD

J1- 3M- 3593-6002



MAGNUM 1022-13

MAGNUM 1022-13

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DASH	QTY	NEXT ASSY	USED ON	SERIAL NO.	DATE EFF	DWG REV
APPLICATION				EFFECTIVITY		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .03; .XXX ± .010
ANGLES: 0°30'

HOLE TOLERANCES

.013 THRU .128	+.004 −.001	.321 THRU .500	+.006 −.001
.136 THRU .250	+.005 −.001	.501 THRU .750	+.006 −.001

MATERIAL ⚠1
FINISH ⚠

ENGINEERING ACTIVITY	
DESIGN	JC SYSTEMS INC
DRAFTED	" 15 NOV 1983
CHECKED	
APPROV	
RELEASE	
DO NOT SCALE DWG	

JC SYSTEMS, INC. SAN DIEGO, CALIFORNIA

TITLE: PRINTED CIRCUIT BD ASSY- PORT TRANSITION MODEL A1604

SIZE	CODE IDENT	
C		1604

SCALE 2:1 SHEET 1 OF 1

⚠ FINISH (IF APPLICABLE)

⚠ MATL (IF APPLICABLE)

NOTES: UNLESS OTHERWISE SPECIFIED